The 4 control dogs showed no significant differences in AFR generation when comparing shocks administered before and after saline infusion rather than SOD/CAT. *Conclusion:* antioxidant enzymes markedly attenuate free radical generation by DC shocks. If free radicals are a mechanism of defibrillation injury in patients, drugs with free radical inhibiting or scavenging properties may prevent such injury.

959-102 What "Dose" of Oxygen is Required in Treating Prolonged Cardiac Arrest

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Introduction: Selective aortic (Ao) perfusion and oxygenation (SAPO) with oxygenated ultra-purified polymerized bovine hemoglobin (UPBH) is an effective adjunct to ACLS in the treatment of cardiac arrest. The optimal volume of oxygenated UPBH, equivalent to a dosage of oxygen, is not known.

Purpose: Determine the dose/response relationship between intra-Ao UPBH and return of spontaneous circulation (ROSC).

Methods: Randomized, interventional study using a canine model of VF with a prolonged "down-time" and CPR based on external chest compression. After chloralose anesthesia, the blood gases and vital signs were normalized. ECG, Ao arch and intra-esophageal pressures were measured continuously. A descending Ao occlusion-infusion balloon catheter was placed through the femoral artery. Ventricular fibrillation was induced and BLS begun after 10 min. Inter-animal differences in BLS were minimized by standardization of esophageal pulse pressure and Ao blood gases. At 13 min. the Ao occlusion balloon was inflated and 10, 20 or 30 cc/kg of UPBH (equivalent to 1.8, 3.6, and 5.4 ml O2/kg) was infused at 300 cc/min. Defibrillation with 8 J/kg was attempted at end infusion. *Results:* N = 17. Only 2 of 5 animals given 10 cc/kg of UPBH had ROSC, verses 4 of 5 given 20 cc/kg, and all 7 animals given 30 cc/kg had ROSC ($p = 0.05$). All resuscitated animals were alive at one hour. *Conclusions:* There is a dose-response relationship between the volume of oxygen administered by SAPO and the rate of ROSC after prolonged cardiac arrest. Thirty cc/kg of UPBH, equivalent to 5.4 ml O2/kg, appeared optimal in this model.

959-103 A Systematic Approach to the Evaluation of Chest Pain in the Emergency Department: A Prospective Risk Assessment and Treatment Protocol Based on Patient Presentation, ECG and Rest Technetium 99m-Sestamibi

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Ideal treatment of acute myocardial infarction (AMI) and unstable angina (UA) require rapid evaluation and triage in the ED. Appropriate patient triage and disposition can reduce admissions and optimize resource utilization including reduced CCU length of stay (LOS). Historically less than 20 percent of patients admitted with chest pain (CP) rule in for AMI. However, all patients must be initially evaluated in the same fashion until the risk of AMI or UA can be determined and appropriate treatment initiated. Given the diagnostic limitation of the presenting symptoms and initial ECG, we designed and are prospectively testing a systemic protocol to evaluate all patients who present to the ED with CP. All patients are assigned to one of five levels based on risk and probability of AMI and of ischemia: 1. AMI; 2. Probable AMI/UA; 3. Possible AMI/UA; 4. Possible UA; and 5. Non-cardiac CP. In the absence of a diagnostic ECG needed for assignment to level 1, (ST elevation), or level 2, (ST depression), immediate injection of Tc99m-sestamibi in the ED is used to further stratify patients in levels 3 and 4. If the evaluation of any given patient becomes positive, the assigned level is increased to one of higher risk with appropriate changes in therapy.

Since January 1994, 560 patients with potential cardiac chest pain have been enrolled into levels 1–4. Level 5 patients were treated for obvious noncardiac causes. Predicted risk of AMI with distribution of patients and actual incidence of AMI is as follows:

Level	Predicted Risk of AMI	% Patients	AMI (%)	CCU LOS
1	>95%	4%	100%	2.9 days
2	50–95%	31%	21%	1.7 days
3	5–50%	23%	3%	21 hrs
4	<5%	42%	0%	0

There were no in-hospital deaths in any of these patients. This protocol appears safe, can be systematically applied to include all patients who present with CP, and will thus help maximize resource utilization by appropriately triaging patients and reducing LOS.

959-104 The Potential Use of Impedance Cardiography as a Hemodynamic Sensor for Automated External Defibrillators

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Automated external defibrillators use ECG analysis algorithms to identify ventricular fibrillation (VF) and ventricular tachycardia (VT). VT can be associated with a wide range of blood pressures and automated defibrillators determine the need for DC shock based on the heart rate alone. The incorporation of a hemodynamic sensor may improve the accuracy of an automated defibrillator. The impedance cardiogram (ICG) has been used to non-invasively measure cardiac output and its peak value, dz/dt(max), correlates well with aortic blood flow. We have developed a system whereby the ICG can be recorded at cardiac arrests through the same two ECG/defibrillator pads, placed in an antero-apical position, that are used to monitor or shock the patient. At 103 cardiac arrest calls and in 20 healthy volunteers (C) the ICG was recorded for a period of at least 10s without CPR artefact: 9 records were rejected because of poor quality. The rhythms were divided into VF, asystole (As), agonal rhythm (Ag), electromechanical dissociation (EMD), VT requiring DC shock (VTs) and VT not requiring DC shock (VTns). The ICG tracings were ensemble averaged to remove any electrical noise and dz/dt(max) was measured.

dz/dt(max)	C	VTns	VTs	EMD	Ag	VF	As
Mean $\Omega \cdot s^{-1}$	0.622	0.413*	0.191*	0.178*	0.118*	0.112*	0.098*
$\pm$SEM $\Omega \cdot s^{-1}$	0.058	0.041	0.032	0.022	0.011	0.010	0.004
Number	20	20	7	22	20	14	19

*$p < 0.01$ compared with C (Kruskal-Wallis)

C was significantly greater than all other rhythms. VTns was significantly greater than the pulseless rhythms EMD, Ag, VF and As. There was no significant difference between VTs and the pulseless rhythms. Thus the ICG is a potential hemodynamic sensor for automated external defibrillators.

959-105 Emergency Center Tc99m-sestamibi SPECT Imaging for Unexplained Chest Pain: Cost Savings and Outcome Analysis

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Emergent myocardial perfusion imaging (MPI) has been shown to be accurate in diagnosis of acute MI. We assessed the financial and pt outcome implications of such imaging.

Method: 50 pts presenting to emergency center (EC) with unexplained chest pain received resting Tc99m-sestamibi SPECT MPI as part of their EC evaluation with a gamma camera dedicated to this purpose. If resting scan was nl, adenosine stress imaging was performed in EC at cardiologist's (MD) discretion. Influence of MPI was determined by MD questionnaire completed immediately before and after MPI results were made available. Cost savings analysis was based on pre- vs post-MPI management strategy and historical analysis of costs. 45 pts were followed avg 9 months post MPI.

Results: MPI altered pt management in 34/50 pts (68%). 29 pts were sent home rather than admitted based on EC MPI. 9/21 admitted pts were sent to lower intensity beds. Total cost savings was $88,533 ($1771/pt). 35 pts were asymptomatic on follow-up, 8 had recurrent chest pain and 6 had at least 1 EC visit for chest pain. No pt with nl MPI had a major cardiac event or revascularization on follow-up.

Conclusion: The use of acute EC SPECT MPI is a cost effective means of assigning pts to a low risk group that may be followed safely on an outpatient basis.

959-106 Characteristic Mechanisms and Outcome of Cardiopulmonary Arrest in Congestive Heart Failure Patients

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Recent studies suggest the mechanism of sudden death in congestive heart failure (CHF) patients is less frequently VT/VF than previously believed. In order to further understand the characteristics and mechanisms of death in CHF patients, we evaluated 146 patients who underwent cardiopulmonary resuscitation during hospitalization for congestive heart failure, ischemic heart disease, and noncardiac causes. Clinical characteristics and outcomes are described below: